Advances in assessing terrestrial toxicity of metal emissions for improved sustainability characterization of technologies

Owsianiak, Mikolaj; Hauschild, Michael Zwicky

Published in:
Book of Abstracts. DTU's Sustain Conference 2015

Publication date:
2015

Document Version
Publisher's PDF, also known as Version of record

Advances in assessing terrestrial toxicity of metal emissions for improved sustainability characterization of technologies

Mikolaj Owsianiak*[1], Michael Z. Hauschild[1]

1: DTU Management

*Corresponding author email: miow@dtu.dk

Today's technologies strongly rely on the use of metals, and metal emissions also occur from the energy system's thermal power plants. Many metals are toxic in the environment and better methods are needed to quantify the potential environmental impacts that may arise from these metal emissions when assessing environmental sustainability of technologies. Here, recent advances in life cycle impact assessment of metal emissions in terrestrial ecosystems are presented, which include: (i) the development of a new method for calculating comparative toxicity potential (CTP) of cationic metals in soils that addresses speciation in environmental fate, exposure and effects and deals with geographic variability of environmental chemistry parameters at a global scale; (ii) the inclusion of long-term (>100 years) aging mechanisms in the soil as influenced by the type of metal emission source and soil properties in calculation of the CTP values; and (iii) the development of quantitative ion character – activity relationships for prediction of metal exposure in soils. The influence of these advances on quantitative assessments of environmental sustainability of technologies will be illustrated on a case study of power generation from coal-fired power plants, and perspectives for assessing environmental impacts from a total of 60 elements of metallic character which are all used in today's technologies, will be presented.